



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/911,764	07/25/2001	Apostolis Papathanasiou	17390US01	5067
23446 7590 05/08/2008 MCANDREWS HELD & MALLOY, LTD 500 WEST MADISON STREET SUITE 3400 CHICAGO, IL 60661				
EXAMINER				
DO, CHAT C				
ART UNIT		PAPER NUMBER		
2193				
MAIL DATE		DELIVERY MODE		
05/08/2008		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary**Application No.**

09/911,764

Applicant(s)

PAPATHANASIOU, APOSTOLIS

Examiner

CHAT C. DO

Art Unit

2193

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 January 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 20-53 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 20-53 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date: _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

1. This communication is responsive to Amendment filed 01/28/2008.
2. Claims 20-53 are pending in this application. Claims 20 and 37 are independent claims. In Amendment, claims 1-19 are previously cancelled and claims 37-53 are newly added. This Office Action is made non-final.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.
4. Claims 20-53 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 20-53 cite a system for processing data in accordance with a mathematical algorithm. However, claims 20-53 merely disclose series mental steps/components for performing operations comprising mathematical transformation and solving system without disclosing a practical/physical application. Further, the claims appear to preempt every substantial practical application of the idea embodied by the claims. In addition, claims 20-36 are considered as software per se since all the means are the software module for performing the intended function. Even though, the claims disclose a filtering parameters and filtering processes, but this filtering process can be mathematical filtering

and the final result is just a parameter. Therefore, claims 20-53 are directed to non-statutory subject matter.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 20-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Martin et al. ("Unitary ESPRIT: How to Obtain Increased Estimation Accuracy with a Reduced Computational Burden") in view of the admitted prior art.

Re claim 20, Martin et al. disclose in the article a system for processing signals (e.g. abstract in page 1232 and conclusion remark in page 1241 by filtering/reconstructing the original waveform/signal), the system comprising: means for transforming adaptation observations from a complex arithmetic to two sets of real number arithmetic observations by means of binary orthogonalization transformation (BOT) (e.g. page 1232 right column lines 3-17 which transforming/converting the complex matrices into a set of real matrices); a means for computing two sets of real number arithmetic adaptation parameters by applying a solution algorithm to said two sets of real number arithmetic observations (e.g. section B as real implementation in page 1236 wherein least square solution can be applied here); and means for transforming said two sets of real adaptation parameters to a set of complex number arithmetic adaptation

parameters using an inverse binary orthogonalization transform (IBOT) (e.g. as reversed processed of BOT above, page 1232 right column lines of first paragraph, and right column lines 8-10 page 1232), wherein said set of complex number arithmetic adaptation parameters are used as filter parameters for adaptive filtering of the signal (e.g. abstract in page 1232 for filtering/reconstructing the original waveform/signal using the above technique).

Martin et al. fail to explicitly spell-out the term LESS as a means for computing two sets of real number arithmetic adaptation parameters by applying two real number Least Square Solvers (LESS) to said two sets of real number arithmetic observations. However, the admitted prior art discloses in page 1 a means for computing two sets of real number arithmetic adaptation parameters by applying two real number Least Square Solvers (LESS) to said two sets of real number arithmetic observations (e.g. last two paragraphs in page 1 wherein LESS is common and most widely used in solving such systems of linear equations).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add a means for computing two sets of real number arithmetic adaptation parameters by applying two real number Least Square Solvers (LESS) to said two sets of real number arithmetic observations as taught in the admitted prior art to Martin et al.'s invention because it would enable to solve unknowns in linear equations efficiently (e.g. as common and widely used in many practical application in page 1 of the original application).

Re claims 21-22, Martin et al. fail to disclose two real number LESS are applied in parallel and series. However, the admitted prior art discloses in Figure 1 the LESS are applied in series manner (e.g. component 100 in Figure 1) and the examiner takes an office notice that operating an algorithm in parallel manner is well-known in the art and widely used in many practical application in the technology.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to apply the LESS in parallel and series manner into Martin's invention because it would enable to improve the system performance (e.g. parallel manner would increase the speed operation and series manner would increase the dependency).

Re claims 23-24, Martin fails to disclose the LESS comprises a Recursive Least Squares algorithm (RLS) and a Least Mean Squares (LMS) algorithm. However, the admitted prior art discloses the LESS comprises RLS and LMS (e.g. last two paragraphs in page 1 of original specification).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the LESS comprises RLS and LMS as taught in the admitted prior art to Martin et al.'s invention because it would enable to solve unknowns in linear equations efficiently (e.g. as common and widely used in many practical application in page 1 of the original application).

Re claims 25-27, Martin et al. fail to disclose LESS is a Householder transformation; Cholesky decomposition; and QR Decomposition (QRD). However, the admitted prior art discloses the LESS is a Householder transformation (e.g. last paragraph

in page 4); Cholesky decomposition (e.g. last paragraph in page 4); and QR Decomposition (QRD) (e.g. last two paragraphs in page 1).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the LESS is a Householder transformation; Cholesky decomposition; and QR Decomposition (QRD) as taught in the admitted prior art to Martin et al.'s invention because it would enable to solve unknowns in linear equations efficiently (e.g. as common and widely used in many practical application in page 1 of the original application).

Re claim 28, Martin et al. fail to disclose the RLS is computed by a systolic array. However, the admitted prior art discloses the RLS is computed by a systolic array (e.g. page paragraph in page 4).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the RLS is computed by a systolic array as taught in the admitted prior art to Martin et al.'s invention because it would enable to improve the system performance (e.g. by implementing the systolic array).

Re claims 29-30, Martin et al. fail to disclose the LESS utilizes one or more a Block Matched Filter Estimator (BMFE), a Block Zero Forcing Estimator (BZFE), and/or a Block Minimum Mean Square Error Estimator (BMMSEE) and computed via one or both a Cholesky decomposition and a QR Decomposition (QRD). However, the admitted prior art discloses in Figure 1 the LESS utilizes one or more a Block Matched Filter Estimator (BMFE), a Block Zero Forcing Estimator (BZFE), and/or a Block Minimum Mean Square Error Estimator (BMMSEE) (e.g. last four lines of last paragraph in page 4)

and computed via one or both a Cholesky decomposition and a QR Decomposition (QRD) (e.g. last paragraph in page 4).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add the LESS utilizes one or more a Block Matched Filter Estimator (BMFE), a Block Zero Forcing Estimator (BZFE), and/or a Block Minimum Mean Square Error Estimator (BMMSEE) and computed via one or both a Cholesky decomposition and a QR Decomposition (QRD) as taught in the admitted prior art to Martin et al.'s invention because it would enable to solve unknowns in linear equations efficiently (e.g. as common and widely used in many practical application in page 1 of the original application).

Re claim 31, it has similar limitations cited in claim 20. Thus, claim 31 is also rejected under the same rationale as cited in the rejection of rejected claim 20.

Re claims 32-36, Martin et al. do not disclose linear system performing one or more of temporal, spatial, joint temporal, and/or spatial channel estimation of the signal; spatial channel equalization, carrier frequency estimation, Direction of Arrival (DOA) estimation, and joint carrier frequency and DOA estimation, an adaptive filter, and channel estimation, system parameter estimation, channel equalization, recursive updating of output parameters, non-recursive updating of output parameters, and system identification. However, the admitted prior art discloses in Figure 1 linear system performing one or more of temporal, spatial, joint temporal, and/or spatial channel estimation of the signal; spatial channel equalization, carrier frequency estimation, Direction of Arrival (DOA) estimation, and joint carrier frequency and DOA estimation,

an adaptive filter, and channel estimation, system parameter estimation, channel equalization, recursive updating of output parameters, non-recursive updating of output parameters, and system identification (e.g. page 1 and page 4 as under background of invention and admitted prior art Figure 1).

Therefore, it would have been obvious applications to a person having ordinary skill in the art at the time the invention is made to apply the linear system performing one or more of temporal, spatial, joint temporal, and/or spatial channel estimation of the signal; spatial channel equalization, carrier frequency estimation, Direction of Arrival (DOA) estimation, and joint carrier frequency and DOA estimation, an adaptive filter, and channel estimation, system parameter estimation, channel equalization, recursive updating of output parameters, non-recursive updating of output parameters, and system identification as taught in the admitted prior art to Martin et al.'s invention because it would enable to reduce the complexity of computing the estimated signals.

Re claim 37, it is a system claim having similar limitations cited in claim 20. Thus, claim 37 is also rejected under the same rationale as cited in the rejection of rejected claim 20.

Re claim 38, it is a system claim having similar limitations cited in claim 21. Thus, claim 38 is also rejected under the same rationale as cited in the rejection of rejected claim 21.

Re claim 39, it is a system claim having similar limitations cited in claim 22. Thus, claim 39 is also rejected under the same rationale as cited in the rejection of rejected claim 22.

Re claim 40, it is a system claim having similar limitations cited in claim 23. Thus, claim 40 is also rejected under the same rationale as cited in the rejection of rejected claim 23.

Re claim 41, it is a system claim having similar limitations cited in claim 24. Thus, claim 41 is also rejected under the same rationale as cited in the rejection of rejected claim 24.

Re claim 42, it is a system claim having similar limitations cited in claim 25. Thus, claim 42 is also rejected under the same rationale as cited in the rejection of rejected claim 25.

Re claim 43, it is a system claim having similar limitations cited in claim 26. Thus, claim 43 is also rejected under the same rationale as cited in the rejection of rejected claim 26.

Re claim 44, it is a system claim having similar limitations cited in claim 27. Thus, claim 44 is also rejected under the same rationale as cited in the rejection of rejected claim 27.

Re claim 45, it is a system claim having similar limitations cited in claim 28. Thus, claim 45 is also rejected under the same rationale as cited in the rejection of rejected claim 28.

Re claim 46, it is a system claim having similar limitations cited in claim 29. Thus, claim 46 is also rejected under the same rationale as cited in the rejection of rejected claim 29.

Re claim 47, it is a system claim having similar limitations cited in claim 30. Thus, claim 47 is also rejected under the same rationale as cited in the rejection of rejected claim 30.

Re claim 48, it is a system claim having similar limitations cited in claim 31. Thus, claim 48 is also rejected under the same rationale as cited in the rejection of rejected claim 31.

Re claim 49, it is a system claim having similar limitations cited in claim 32. Thus, claim 49 is also rejected under the same rationale as cited in the rejection of rejected claim 32.

Re claim 50, it is a system claim having similar limitations cited in claim 33. Thus, claim 50 is also rejected under the same rationale as cited in the rejection of rejected claim 33.

Re claim 51, it is a system claim having similar limitations cited in claim 34. Thus, claim 51 is also rejected under the same rationale as cited in the rejection of rejected claim 34.

Re claim 52, it is a system claim having similar limitations cited in claim 35. Thus, claim 52 is also rejected under the same rationale as cited in the rejection of rejected claim 35.

Re claim 53, it is a system claim having similar limitations cited in claim 36. Thus, claim 53 is also rejected under the same rationale as cited in the rejection of rejected claim 36.

Response to Arguments

7. Applicant's arguments with respect to claims 20-53 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (571) 272-3721. The examiner can normally be reached on M => F from 7:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lewis Bullock can be reached on (571) 272-3759. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Chat C. Do/
Primary Examiner, Art Unit 2193

May 6, 2008

Application Number

Application/Control No.

09/911,764

Applicant(s)/Patent under
ReexaminationPAPATHANASIOU,
APOSTOLIS

Examiner

CHAT C. DO

Art Unit

2193